<u>Remarks</u>

In view of the above amendments and the following remarks, favorable reconsideration of the outstanding office action is respectfully requested.

Attached hereto is a page entitled "Version of Markings to Show Changes Made."

Claims 1-17 remain in this application. Claims 6 and 14 have been amended.

Drawings

Applicant amended Figure 1 by deleting lines "I/P Signal=136-1380nm" and "O/P signal=136-11280nm". The proposed amendment to Figure 1 is indicated in red.

Claim objections

Claim 14 stands objected to because of the lack of the antecedent basis. Claim 14 has been amended, as suggested by the Examiner, to correct for this informality.

With regard to claim 17, applicants were not able to locate the double "and". Claim 17 recites the material "Nd", followed by the word "and". Accordingly, claim 17 does not require any corrections.

§ 103 Rejections

Claims 1-4 and 6-12 stand under 35 U.S.C. § 103(a) as being unpatentable for obviousness over U.S. Patent No. 4936650 (Ainslie et al.) in light of U.S. Patent No. 5858891 (Auzel et al.).

Claims 1-4 and 6-12 specify that the glass ceramic material which contains a plurality of crystalites, wherein at least 90% of rare-earth dopant is situated within the crystalites.

The Examiner admitted that the Ainslie reference <u>does not</u> disclose at least 9% or essentially all rare earth dopant with crystalites, but pointed out that the Auzel reference discloses this feature. The Examiner then stated: "It would have been obvious, to one of ordinary skill in the art at the time the invention was made, to have at least 95% or essentially all dopant of Auzel et al. With device of Ainslie et al., since <u>one would be motivated to include the dopant in the glass-ceramic fiber for high effective sections and good quantum efficiencies shown by Auzel</u> et al. (col. 1, lines 10-16) when a signal is transmitted through."

Applicants respectfully disagree for the following reasons:

The Auzel reference does not teach that it is better to have high concentration of the rare earth dopant within crystalites because it improves quantum efficiency. More specifically, it is well known to one of ordinary skill in the art that because of quenching not all ions are improved by having 90% or more of the rare earth dopant in the crystalites. For example, erbium (Er) is quenched when its concentration reaches about 1000 part per million (wt) or 0.1%. That is, when Er concentration reaches about 0.1wt% within crystalites, Er ions are quenched sooner than if they were equally distributed within the glass. Thus, more concentration of Er within the crystalites does not produce better quantum efficiency.

Furthermore, the Ainslie reference discloses the make-up of crystalites (see col. 2, lns 5-10). Such crystalites are not capable of containing a large amount of rare earth dopant (i.e. more than 90%).

Accordingly, the two cited references provide no incentive to increase Er concentration within the crystalites of the Ainslie material. Therefore, because neither of the two cited references points out or teaches the reasons for the combination suggested by the examiner, claims 1-4 and 6-12 are not obvious over U.S. Patent No. 4936650 (Ainslie et al.) in light of U.S. Patent No. 5858891 (Auzel et al.).

Regarding claim 4, the Examiner also stated " It would have been obvious, to one of ordinary skill in the art at the time the invention was made, to have crystals less than 10nm with the suggested device of Auzel et al. In view of Ainslie et al., since where in the general conditions of a claim are disclosed in the prior art, discovering optimum or workable ranges involves only routine skill in the art. One would be motivated to have crystals less than 10nm in order to exhibit the required optical transparency, which is most appropriate for laser and optical amplification applications as shown by Auzel et al. (col. 2, lns. 37-40) instead of larger crystals, which cause optical scattering which is unsuitable for a laser as shown by Auzel et al (col.1, lines 47-50)."

Applicants respectfully disagree. Not all crystals can be made to be less than 10nm. There is no indication (in the reference itself) that the cited reference achieved such small crystal size when at least 90% of rare earth dopant is situated within the crystalites.

The Examiner has rejected claims 5 and 14-16 under 35 U.S.C. § 103(a) as being unpatentable for obviousness over U.S. Patent No. 4936650 (Ainslie et al.) in light of U.S. Patent No. 5858891 (Auzel et al.) as applied to claims 1 and 7 above, and further in view of Patent WO 98/54607 (Bange et al.).

Claim 5 depends from claim 1 as its base claim and, therefore, expressly incorporates the language of claim 1. Claims 14-16 depend from claim 7 as their base claim and, therefore, expressly incorporate the language of claim 7. Accordingly, claims 5 and 14-16 are not obvious over the cited art for the same reasons that claims 1 and 7 are not obvious over the cited art. In addition, claims 5, 14-16 specify that stimulated emission and absorption line shapes of said glass-ceramic rare earth doped fiber are <u>narrower</u> than that stimulated emission and absorption profile of a precursor rare earth doped glass.

The Auzel and Ainslie reference <u>do not</u> disclose this feature. However, the Examiner stated (pg. 4 of the Office Action) that "Bange et a. teaches emission lines of glass ceramic fiber <u>narrower</u> than the precursor or similar glass for <u>narrower</u> peaks".

Applicants respectfully disagree. The Bange et al. reference specifies that absorption line shapes of said glass-ceramic rare earth doped fiber are <u>wider</u> than that stimulated emission and absorption profile of a precursor rare earth doped glass. (See, for example, pg.13, ln. 15 of this reference.)

Finally, on page 5 of the Office Action, the Examiner stated that "it would be obvious to one of ordinary skill in the art at the time the invention was made, to have 1320 to 1360nm peaks with the suggested device of Ainsile et al. in view of Auzel et al. and Bange et al., since finding the optimum or workable ranges involves only routine skill in the art."

Applicants respectfully disagree. One of ordinary skill in the art would have trouble finding this range without a reasonable amount of guidance or direction. <u>Finding the claimed optimum work range without applicant's teaching would not be possible without undue experimentation</u>. That is, finding the optimal ranges based on the cited art, without additional teaching present in the references themselves, would be like looking for a needle in a haystack. It would <u>not</u> involve "only routine skill in the art". Accordingly, because the cited references either separately, or in combination, do not disclose, teach or suggest the claim invention, claims 5 and 14-16 are not obvious over these references.

Claim 13 stands under 35 U.S.C. § 103(a) as being unpatentable for obviousness over U.S. Patent No. 4936650 (Ainslie et al.) in light of U.S. Patent No. 5858891 (Auzel et al.) as applied to claim 7 above, and further in view of US Patent 6217204 (Arima).

Claim 13 depends from claim 7 as its base and, therefore, expressly incorporates the language of claim 7. Accordingly, claim 13 is not obvious over the cited art for the same reasons that claims 7 is not obvious over the cited art.

Claim 17 stand rejected U.S.C. § 103(a) as being unpatentable for obviousness over U.S. Patent No. 4936650 (Ainslie et al.) in light of U.S. Patent No. 5858891 (Auzel et al.) as applied to claim 7 above, and further in view of Patent WO 98/02388 (Samson et al.).

Claim 17 depends from claim 7 as its base and, therefore, expressly incorporates the language of claim 7. Accordingly, claim 17 is not obvious over the cited art for the same reasons that claims 7 is not obvious over the cited art.

Furthermore, the teaching of Samson reference are not applicable to the invention of claim 17, because the Samson reference discloses ESA shifts in glass, not in glass-ceramic as claimed by the applicants. The Samson reference does not teach, suggests or implies that ESA shifts can happen in glass ceramic. Accordingly, because the references themselves did not provide the teaching or suggestion for the claimed combination, claim 17 is not obvious over U.S. Patent No. 4936650 (Ainslie et al.) in light of U.S. Patent No. 5858891 (Auzel et al.) as applied to claim 7 above, and further in view of Patent WO 98/02388 (Samson et al.).

Conclusion

Based upon the above amendments, remarks, and papers of record, Applicant believes the pending claims of the above-captioned application are in allowable form and patentable over the prior art of record. Applicant respectfully request reconsideration of the pending claims 1-17 and a prompt Notice of Allowance thereon.

Applicant believes that no extension of time is necessary to make this Response timely. Should Applicant be in error, Applicant respectfully requests that the Office grant such time extension pursuant to 37 C.F.R. § 1.136(a) as necessary to make this Reply timely, and hereby authorizes the Office to charge any necessary fee or surcharge with respect to said

time extension to the deposit account of the undersigned firm of attorneys, Deposit Account 03-3325.

Please direct any questions or comments to Svetlana Short at (607) 974-0412.

Respectfully submitted,

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Svetlana Short
Signature

1/7/03
Date of Signature

VERSION OF MARKINGS TO SHOW CHANGES MADE

What is claimed:

1. A glass-ceramic rare earth doped fiber, said glass-ceramic fiber comprising a plurality of crystallites, wherein at least 90% of the rare earth dopant is situated within said crystallites.

2. The glass-ceramic rare earth doped fiber according to claim 1, wherein said crystallites are 1000-nm or smaller.

3. The glass-ceramic rare earth doped fiber according to claim 1, wherein said crystallites are 100nm or smaller.

4. The glass-ceramic rare earth doped fiber according to claim 1, wherein said crystallites are 10nm or smaller.

5. The glass-ceramic rare earth doped fiber according to claim 1, wherein stimulated emission and absorption line shapes of said glass-ceramic rare earth doped fiber are narrower than that stimulated emission and absorption profile of a precursor rare earth doped glass.

6. **(Amended)** The glass-ceramic according to claim 1 wherein said rare earth dopant is Pr, Er, [Nd,] Tm, or Dy, where dopant level is greater than 100ppm.

7. An optical amplifier comprising:

(i) an input port ;

(ii) a length of glass-ceramic rare earth doped fiber, said glass-ceramic fiber being operatively coupled to said input port; said glass-ceramic fiber including a plurality of crystallites, wherein at least 90% of said rare earth dopant is situated within said crystallites;

(iii) at least one of optical pump coupled to said glass-ceramic rare earth doped fiber;

(iv) an output port providing an amplified optical signal; and

(v) at least one optical component situated between said input port and said output port.

8. The optical amplifier according to claim 1, wherein said rare earth dopant is Pr, Nd, Tm, or Dy, Er.

9. The optical amplifier according to claim 7, wherein said crystallites are 1000-nm or smaller.

10. The optical amplifier according to claim 7, wherein said crystallites are 100nm or smaller.

11. The optical amplifier according to claim 7, wherein at least 95% of said rare earth dopant is situated within said crystallites.

12. The optical amplifier according to claim 7, wherein essentially all rare earth dopant is the microcrystalline phase of said glass ceramic fiber, and essentially none of said rare earth dopant is present in a surrounding glass.

13. An amplifier according to claim 7, wherein said optical component is a filter, an optical attenuator, a multiplexer, or an isolator.

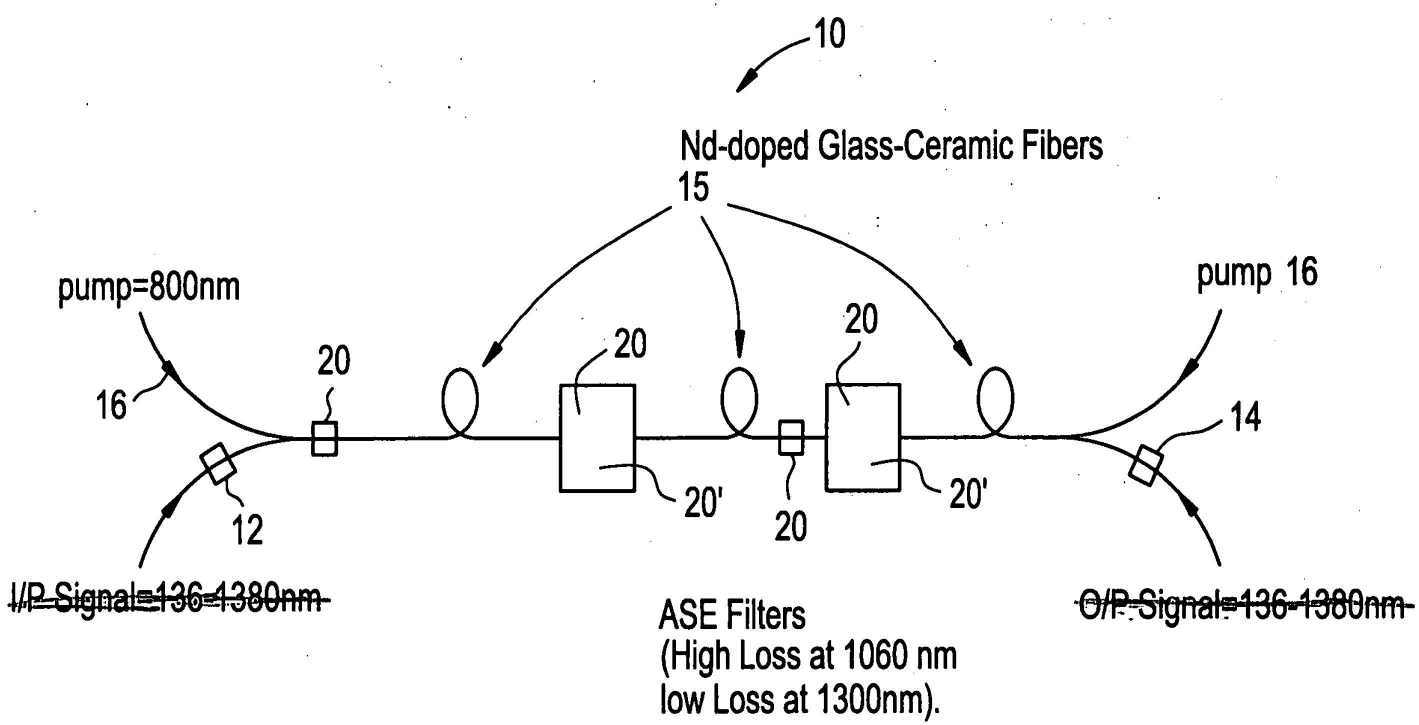
14. **(Amended)** The optical amplifier according to claim 7, wherein stimulated emission profile of said glass ceramic fiber is narrower than that stimulated emission profile of <u>a</u> [the] similarly rare-earth doped glass.

15. The optical amplifier according to claim 7, wherein stimulated emission profile of said glass ceramic fiber is narrower than that stimulated emission profile of a precursor rare earth doped glass.

16. The optical amplifier according to claim 7, wherein individual absorption peaks of the rare earth ions of said glass-ceramic fiber said amplifier providing gain in at least 1320 to 1360 nm range is narrower than that of the precursor rare earth doped glass.

17. The optical amplifier according to claim 7, wherein said rare earth dopant is Nd and said optical amplifier characterized by a shift in ESA spectrum in 1320 nm to 1360 nm wavelength range, with respect to emission.

FIG. 1


10
Nd-doped Glass-Ceramic Fibers
15
pump=800nm
16
20
20
20
20
20'
20'
pump 16
14
12
~~I/P Signal=136-1380nm~~
ASE Filters
(High Loss at 1060 nm
low Loss at 1300nm).
~~O/P Signal=136-1380nm~~